

First exercise:
Organic substances (8.75 points)

Organic substances are molecular compounds that originate from living things, they essentially contain carbon element and generally they contain the elements, hydrogen, oxygen, nitrogen and sometimes sulfur.

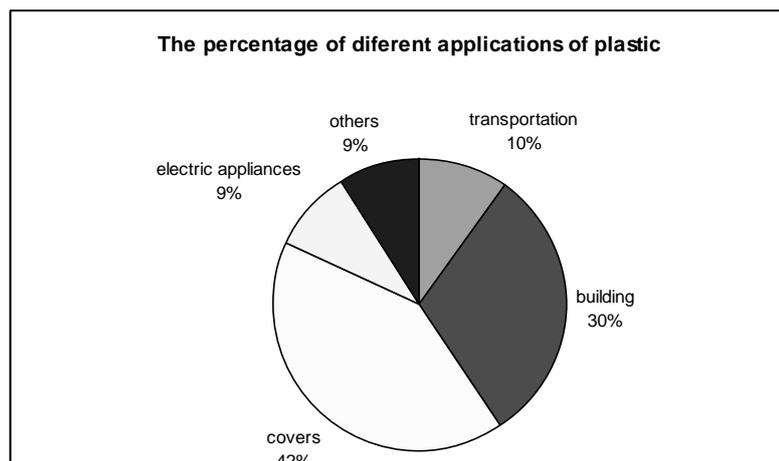
Given: ${}_6^{12}\text{C}$ ${}_1^1\text{H}$ ${}_8^{16}\text{O}$ ${}_{16}^{32}\text{S}$

- 1- Write the electron configuration of H and S.
- 2- Write the Lewis structure of H_2S molecule. Identify whether H_2S is an organic compound or not.
- 3- Methane is a hydrocarbon used as a fuel; it reacts with one chlorine molecule, under suitable conditions to give chlorinated molecule (A).
 - a- Write the corresponding chemical equation. Give the name of the products.
 - b- Identify the type of this reaction.
 - c- Is molecule (A) a hydrocarbon? Justify.
- 4- Butane is another hydrocarbon characterized by its boiling point (-0.5°C) and its freezing point (-138.3°C).
 - a- Write the condensed structural formula of the 2 isomers of butane and give their corresponding IUPAC names.
 - b- Write the equation of the complete combustion of butane.
 - c- One of the products of this combustion is a greenhouse gas.
 - i- Give the consequences of the increase of the amount of this gas in the atmosphere.
 - ii- Suggest a solution to reduce this effect.
 - d- Identify the physical state of butane at -100°C .

Second exercise:
Polymers and their uses (6.5 points)

Read the passage then answer the questions that follow.

Plastic materials are polymers, produced by the addition of hundred molecules named monomers. Polymers are widely used in our daily life due to their long life, to their cheap price and to other properties. The following circular diagram represents the percentage of different applications of plastic.

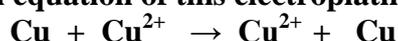


- 1- Transform the above circular graph into a histogram (bar graph).
- 2- Polyethene (PE) is an addition polymer used in the fabrication of bags and bottles.
 - a- Give the name of the monomer (A) forming the polyethene. Write its condensed structural formula.

- b- Indicate the family of hydrocarbons to which (A) belongs and give the general formula of this family.
 - c- Write the chemical equation of polyethene formation using condensed structural formulas.
 - d- The hydration of compound (A) gives a compound (B). Write the structural formula and the name of (B).
- 3- Compound (B) reacts with carboxylic acid to give compound (E).
- a- Write the general formula of carboxylic acid. Circle the functional group and give its name.
 - b- Write the word equation of this reaction giving its name.

Third exercise:
electroplating cell (4.75points)

**An iron spoon of mass X g is required to be plated with copper Cu.
The overall equation of this electroplating process is given below:**



- 1- Write the half equation of the reaction taking place at the cathode.
Determine the mass variation of this cathode.

The adjacent graph shows the variation of the mass of the spoon during 2 hours when a DC-power voltage is applied.

- 2- Specify the initial mass X of the spoon.
Justify your answer.
- 3- Analyze the graph. Draw out a conclusion.
- 4- Calculate the variation of the mass of the spoon at 8V.
- 5- Sketch and label the set up needed to perform the above electroplating cell.
- 6- Will the mass of the spoon vary if it is connected to an AC-power supply rather than a DC-power supply? Justify your answer.

